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Task 2.3
Product #3

Hawks Creek, Riverhead, New York

Management Options

New York State Department of State
Coastal Management Program

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I. Introduction

Tidal inlets are found at the mouths of tidal tributaries. Often, these inlets possess important economic, environmental, and social, values. They provide egress and ingress to and from protected waters, thus serving as important boating access and commercial focal points. Inlets also regulate the exchange of salt and freshwater, thus balancing the unique and highly productive estuarine environment. The littoral transport of sand along a beach is also influenced by the opening, migration and closing of inlets. Finally, inlets provide important social benefits associated with recreation along the shorelines.

Natural inlets are self maintaining and self adjusting. The interaction of tides, freshwater inputs, littoral transport, and coastal storms creates a natural balance of the economic, environmental and social values described above. Often man will develop tidal inlets to improve one or more of these benefits(e.g., dredging a channel and stablizing the inlet shoreline). When such an action is taken, it is imperative that the natural functions of the system are fully understood before construction or other improvements are begun. The inlet must be continually monitored to verify that the original assumptions are valid, and that a balance is still maintained. Conflicts arise when one of the these values is desired to the exclusion of one or more of the others(e.g., navigation for boat access over beach erosion or water quality). These situations are best resolved through negotiation.

In many instances, adequate analysis is not done prior to inlet improvements, and problems may surface years later. It is imperative therefore that these inlets be examined when additional improvements are proposed, or when the past maintenance activities are re-authorized.

This paper synthesizes the available information on the tidal inlet at Hawks Creek, and examines the management options. The option which achieves the desired balance should be selected.

2. Study Area

Economic

Hawks Creek is a small tidal tributary of the Great Peconic Bay on the north fork of Long Island. (Figure 1). Located at the South Jamesport about 36 kilometers east of downtown Riverhead, it is an important access point for about 200 recreational craft. The boat basin is about 18,000 square meters and the throat of the inlet is approximately 23 meters in width. The average depth of the basin is 2 meters below mean low water.

Geology

Geologically, Hawks Creeks flows through Holocene muds and sands, less than 20,000 years old. This coastal area is undergoing a

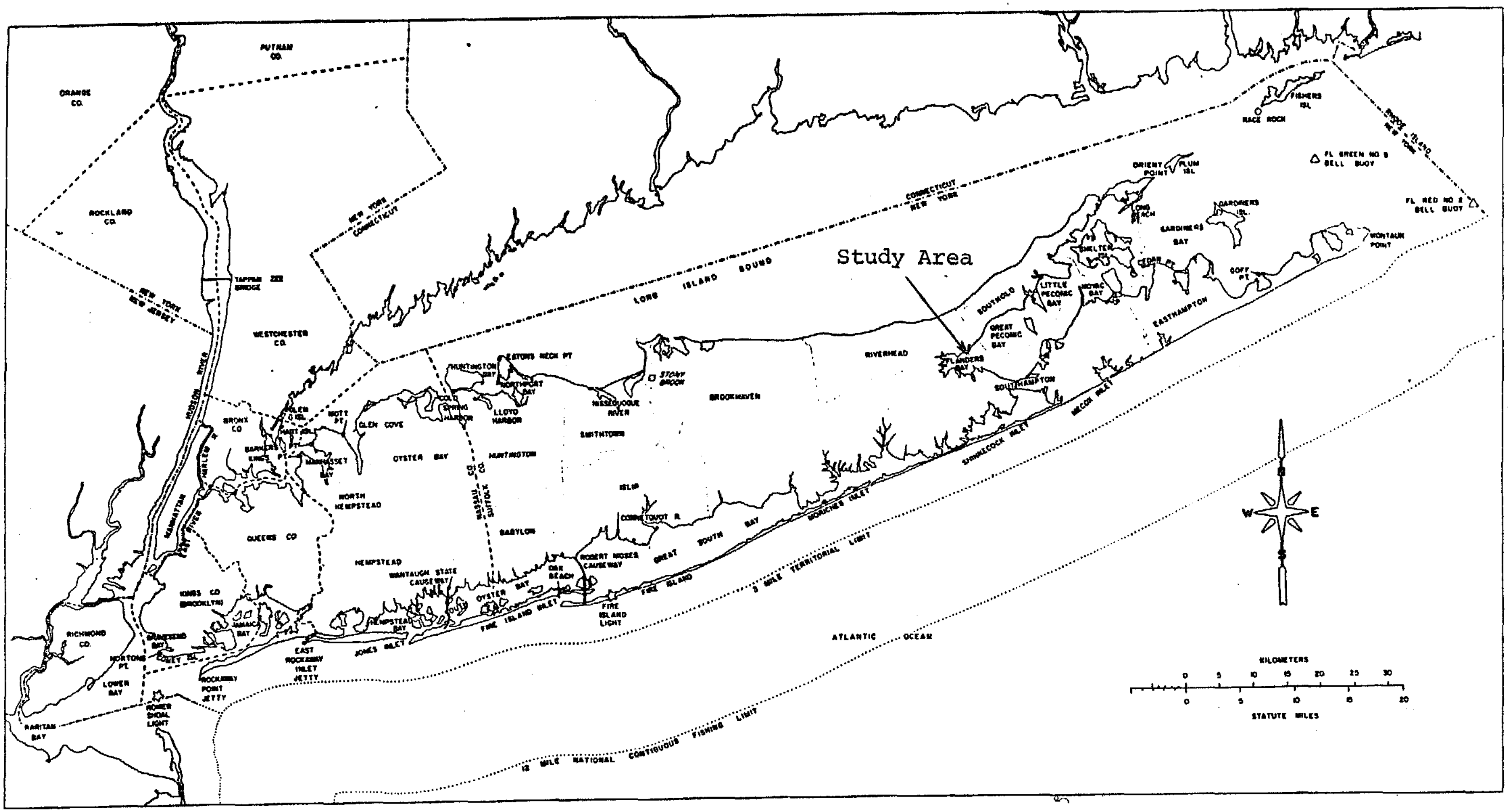


Figure 1: Location diagram of the study area in relation to Long Island.

gradual drowning of the shoreline due to the rise of sea level. The rate of sea level rise is approximately 0.3 meters per century (Disney, 1955 and Donn and Shaw, 1963). However, this rate of sea level change is reportedly increasing (Hicks, 1972)

Tides and Tidal Currents

The tidal range of the semi-diurnal tides in Great Peconic Bay at South Jamesport is 0.82 meters, with a spring range of 0.92 meters. The highest tide of record at South Jamesport is 2.37 meters above mean low water which occurred on September 21, 1938. The ebb current velocity is significantly lower than the flood current in the area west of Robins Island, making the South Jamesport area a zone of deposition (Eisel, 1977). The tidal currents in and out of Hawks Creek run perpendicular to the shoreline, and are probably ebb dominated due to upland drainage. However, no specific information on tidal current direction, velocity and duration is available.

Wind and Waves

The wind direction, velocity and duration are important factors in Great Peconic Bay, since they significantly affect the direction and magnitude of waves. The prevailing winds in this area are from the west, but the strongest are from the northeast, (Eisel, 1977). As shown in Figure 1, the tidal inlet at Hawks Creek faces south-southwest, into the prevailing winds. However, it is sheltered from the more damaging northeast winds by Miamogue Point to the east. The result is a sheltered cove like beach on either side of the inlet.

Littoral Transport

Sand is transported parallel (longshore) to the beach by waves striking the shoreline at an angle. Transport occurs from the zone of breaking waves, to the inland extent of wave uprush on the beach. Littoral transport is important, because it supplies sand to beaches from adjacent sand sources. Obstructions on the beach, either natural or man-made, can cause sand to be trapped on one side of the obstruction and erode on the opposite side. The trapping or deposition side is termed the up-drift side, and the eroding side is called the downdrift side. In many instances, obstructions in the beach and surf zone areas may be used to determine the direction of net littoral drift (transport). Other indicators are sand waves and other natural sand transport features.

The direction of net sand transport at the inlet of Hawks Creek appears to be from east to west. This observation is based on information provided in Eisel (1977), Figure 2, and an examination of existing aerial photography (Figure 3). Miamogue Point is a source area for sand that is transferred to the west by wave refraction around the Point. Littoral transport can, however, be reversed during specific meteorologic events. But, the major storms that strike this area create waves from the east and thus move sand east to west. This condition can cause beaches to widen as a result of coastal storms from the northeast. The magnitude of net transport can

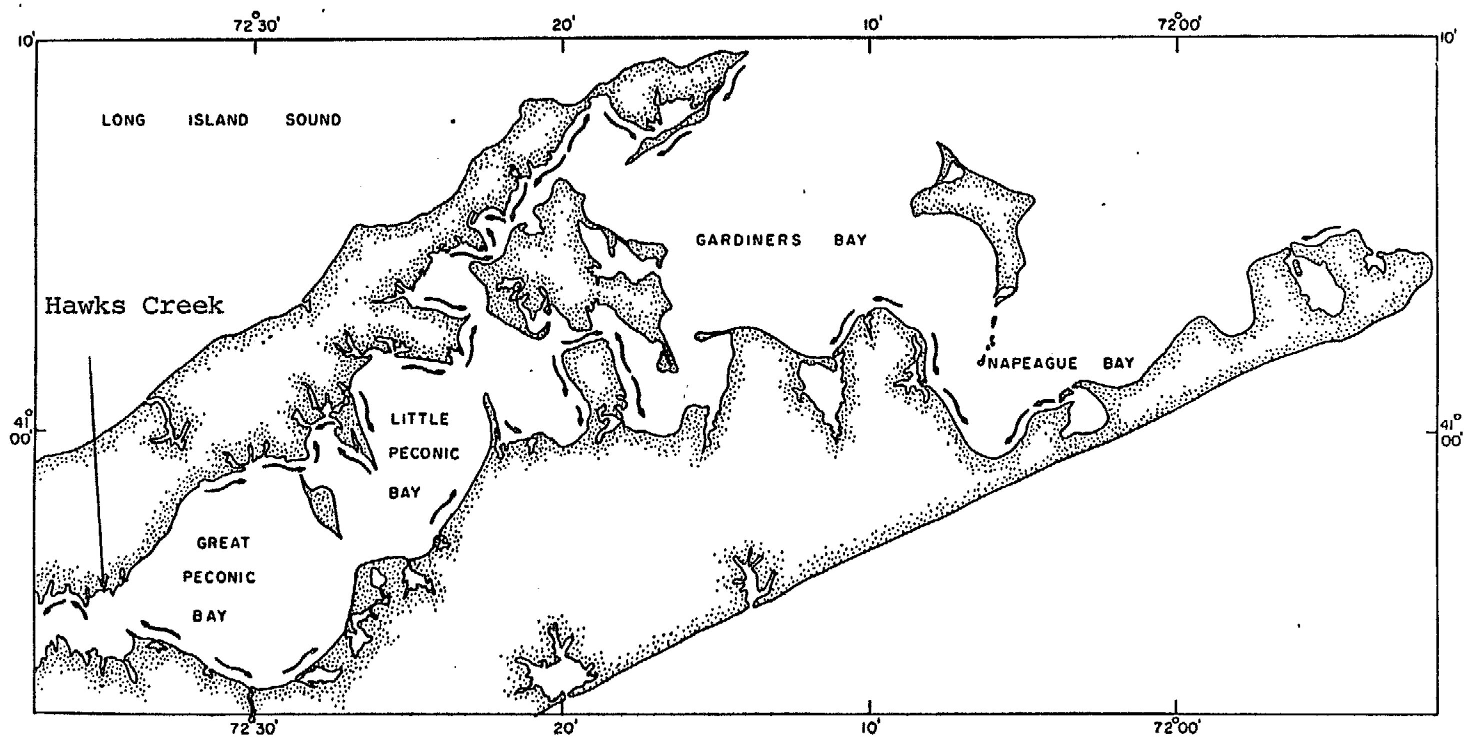


Figure 2: Littoral drift directions in the study area, from Eisel, 1977.

be related to the amounts periodically dredged from the inlet throat. Examination of Suffolk County dredging records (see historical analysis) suggests that the net littoral transport rate is about 800 cubic meters annually from east to west.

Storms

Storms are important to coastal areas, because they often cause dramatic shoreline changes in short periods of time. Coastal storms should not be thought of as "freak events" or "acts of God", but rather as statistically predictable events.

Two principal storm types are pertinent to the study area, hurricanes and extra-tropical storms. Both types have very strong winds from the east and northeast, and can cause similar level of coastal changes. Hurricanes have wind velocities in excess of 74 mph,but occur infrequently. Extratropical storms or northeasters, have winds usually less than 60 mph, but are quite common. Increasingly, storms are being recognized as geologic agents that play an integral role in shoreline development and change. Researchers often consider storm intensity, sand supply and changes in sea level as the three controlling influences in coastal processes.

Data on the coastal changes caused by storms is not available for this area. However, Long Island experiences a storm which causes moderate changes once every two years and a severe storm three times a century (Davies, 1972). The last major storm to strike the study area occurred in March, 1984. Considerable damage occurred in the marina. The inlet channel shoaled, but the beaches appear to have accreted as a result of sand being moved around Miamogue Point.

3. Historical Analysis

Initial Dredging and Jetty Construction

Prior to 1959, Hawks Creek was a more or less pristine wetland, inlet, dune and beach system. Originally called King Creek, this area was draglined to create a deep water boat basin (Rainey, 1985) and the adjacent wetland area was filled to provide upland access. Probably at the same time, or soon thereafter, a road was constructed north of the boat basin. Conduits were placed beneath the road to allow fresh water drainage to enter the basin. The original marina developer also built a short jetty on the east side of the channel, presumably to keep sand from filling in the channel.

Maintenance Dredging

The records of maintenance dredging for the Hawks Creek channel are incomplete, but the following is a compilation of known information. For a period of some twenty years following the original improvement, the owner seasonally removed sand from the inlet channel caused by natural shoaling (Rainey, 1985). The amount of material removed and fate of the material is not known, but local sources estimate that thousands of yards of sand where removed and carted away to an upland site (Rainey, 1985). The

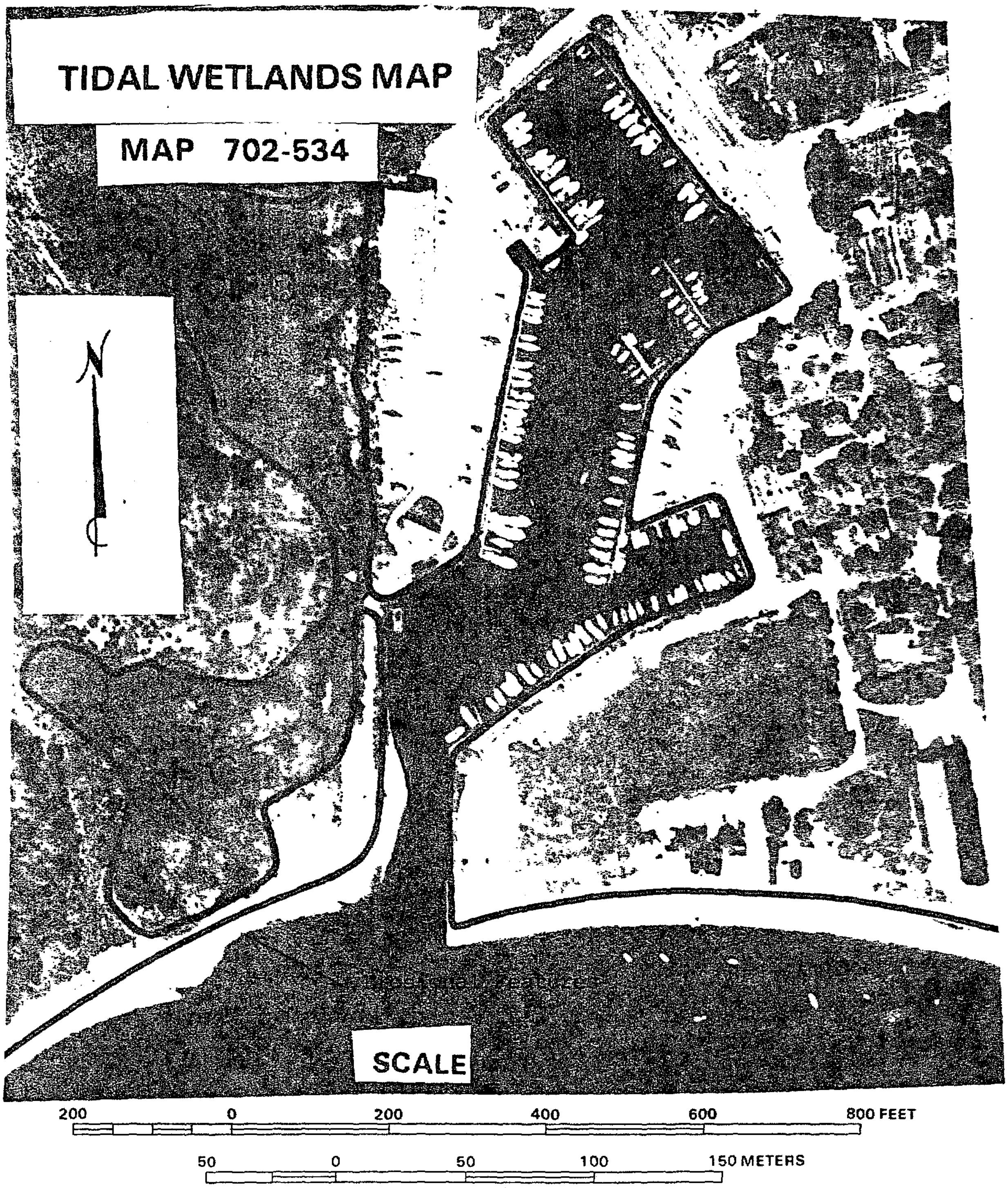


Figure 3: Tidal wetlands map, from NYS Department of Environmental Conservation, 1974.

original dredging permit was modified in 1981 to allow deposition of sand removed from the channel on both the east and west sides of the inlet. The process of alternating sides on a yearly basis continues to the present.

In addition to private efforts, Suffolk County has dredged Hawks Creek five times; 1966, 1975, and 1982, (SCDPW, 1984) in the following amounts:

1966	-	23,586	cubic meters
1975	-	1,137	cubic meters
1982	-	956	cubic meters
1983	-	956	cubic meters
1984	-	1,916	cubic meters
		28,551	cubic meters

This material was probably deposited on the beaches adjacent to the inlet. The large amount of material dredged in 1966 is probably the result of establishing the existing channel into Great Peconic Bay. Only small amounts where required to be removed thereafter to maintain the channel at its authorized dimensions.

4. Impacts of Inlet Modification

The immediate impact of dredging and bulkheading the inlet area was the loss of tidal wetlands and changes to the water circulation conditions of the basin. However, other significant changes have occurred over the almost thirty years since original construction of the marina.

Shoreline Changes

The original shoreline of the Hawks Creek area, prior to dredging, was a concentric beach with a small tidal inlet and shoal system in the middle (see Figure 3). The present shoreline (Figures 4 and 5) shows the eastern shore to be farther seaward than or offset from the western shore. This condition could be the result of sand moving east to west and preferentially depositing east of the constructed jetty. The western shoreline also displays erosional indentations that might be caused by waves refracting around the eastern jetty and the loss of sand trapped by the eastern jetty (see Terchunian and Fletcher, 1984). The dune area on the western shore is scarped, and the beach in this area is narrow. All of these characteristics indicate an erosional setting.

The shoreline east of the inlet is a broad arcuate shore which is characteristic of areas up-drift of obstructions. The beach is wide, and the dune slopes gently to meet the almost flat beach. These characteristics indicate a depositional or stable environment. The dune east of the Creek are generally sound. However, the area immediately east of the jetty and the area in front of the residences to the east is nearly void of vegetation. This is probably due to human trafficing near the houses and improper dredge spoil disposal near the jetty.

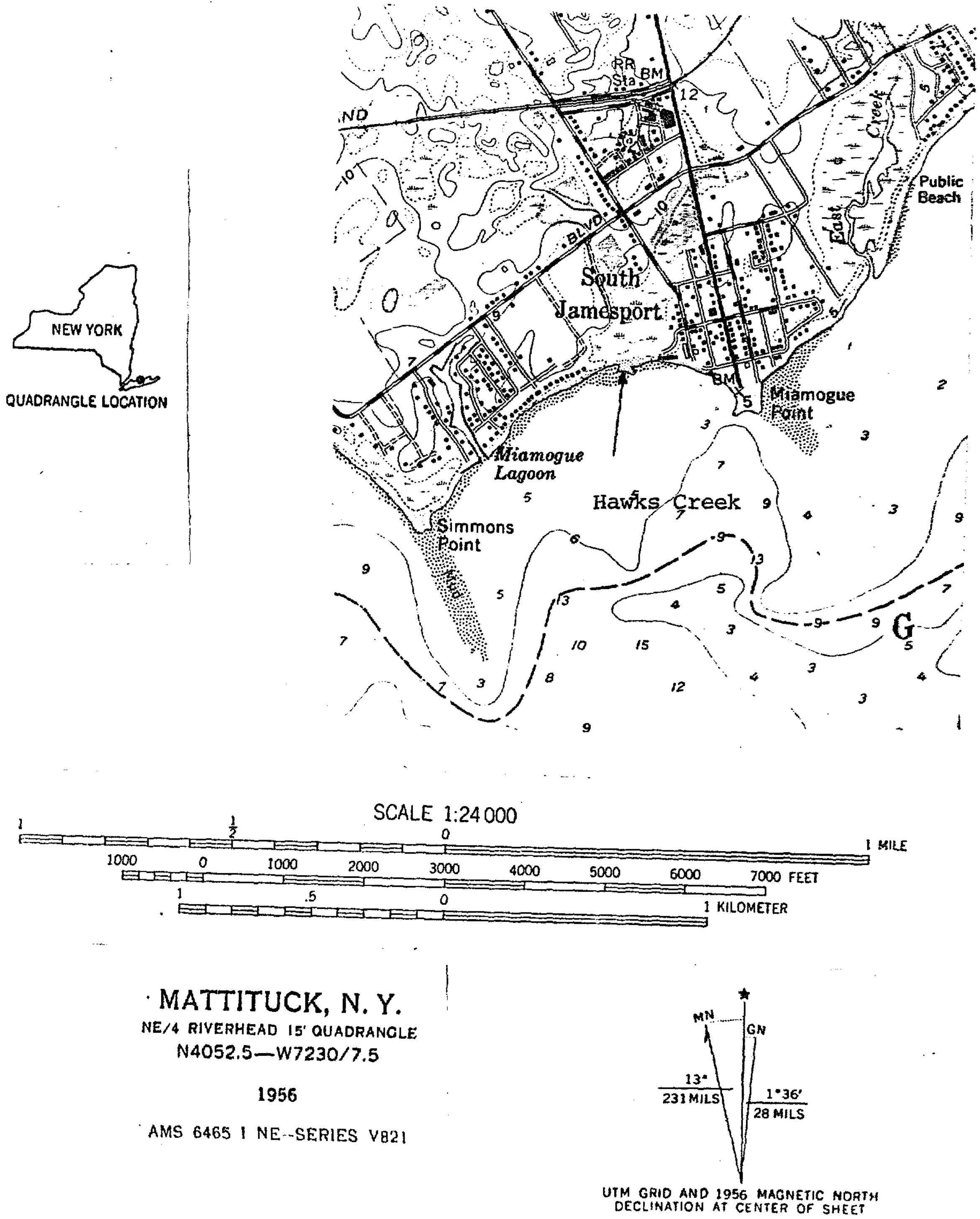
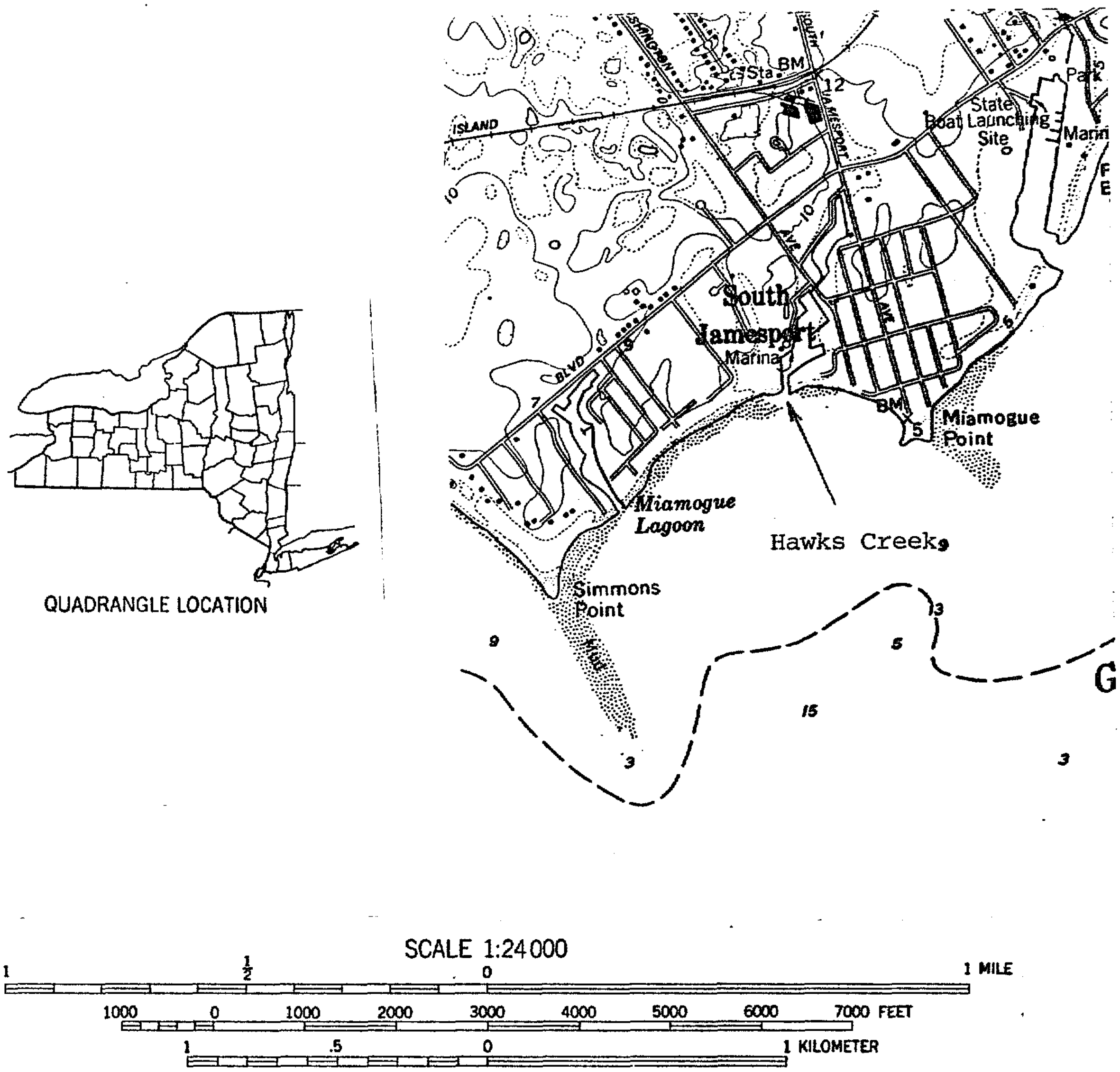


Figure 4: The study area in 1956. Note the extensive tidal marsh and the tidal shoal which protrudes from the shoreline. Hawks Creek is now located in the location of the tidal delta.



Polyconic projection. 1927 North American datum.

MATTITUCK QUADRANGLE

1981 EDITION

Figure 5: The study area in 1981. Note the location of Hawks Creek relative to the tidal delta. Also notice the offset between the east and west shoreline.

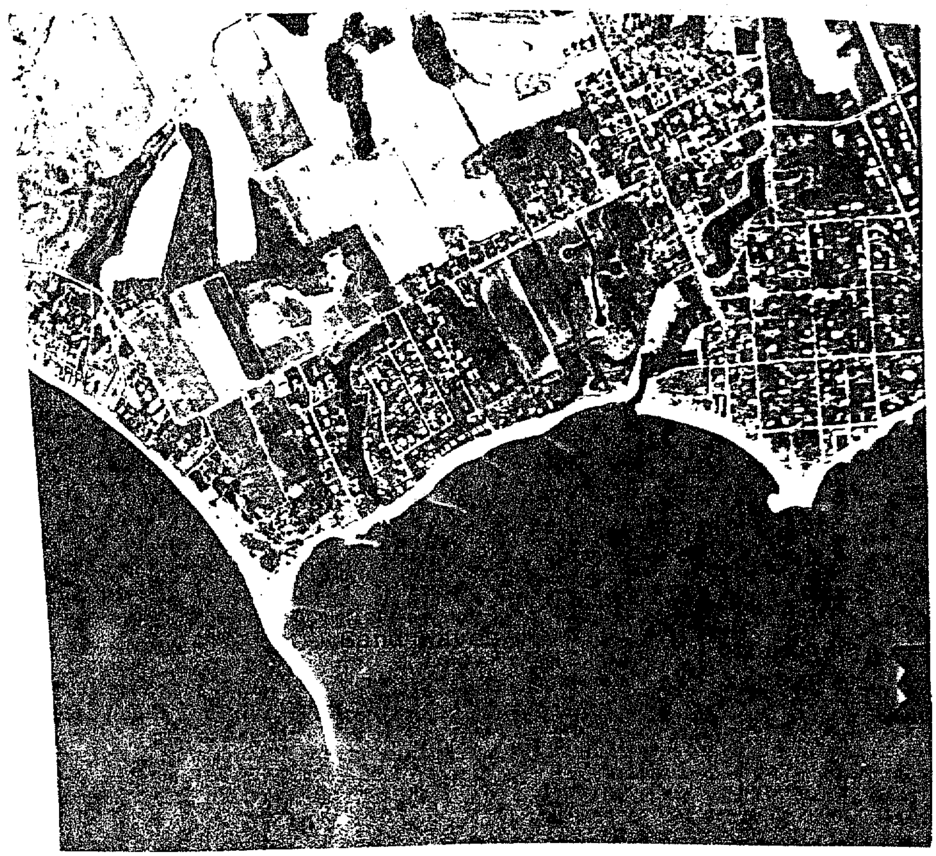


Figure 6: Aerial photograph of the study area (April 21, 1983). Littoral drift from east to west may be deduced from the sand at the tip of Miamogue Point, the sand entering the channel of Hawks Creek and the sand waves west of Hawks Creek.

Bathymetric Changes

The bathymetry of Hawks Creek has been radically altered by creating the marina. Where once there was a small tidal delta seaward of the Creek, there is now a six foot deep channel. The normal bypass of sediment across the tidal delta is no longer possible. Therefore, sand deposits in the channel. According to local sources and aerial photographs, sand enters the channel from both the east and west sides. On the east side, sand flows around the seaward end of the jetty and deposits in the channel. This accounts for most of the sand deposited in the channel and is the principal cause of navigation problems. On the west side, where there is no jetty, sand enters the waterway during littoral transport reversals. This smaller shoal is less of a navigation hazard, but it can become a problem after several years.

If no dredging were to occur, the inlet channel would eventually shoal and a tidal delta would reform.

5. Conclusions

1. Net littoral drift at Hawks Creek is from east to west at a rate of about 800 cubic meters annually.

2. The Creek mouth or inlet throat appears to shoal from both the east and west sides.

3. The shoreline east of the Creek is stable.

4. The shoreline west of the Creek is eroding.

5. The dune east of Hawks Creek is depleted in areas due to human trafficing and improper dredge spoil disposal.

6. Continued dredging is necessary to maintain a navigation channel.

6. Management Options

The following three options have been advanced by interested parties.
-- Option 1:

Under this option, the existing permits for dredging would remain in effect, allowing material to be deposited on both the east and west sides of Hawks Creek.

No additional erosion protection or navigation structures would be built on either side of the inlet.

-- Option 2:

A new 200 foot jetty would be constructed on the western side of Hawks Creek, and the eastern jetty would be extended 50' seaward.

Dredge material would be alternately deposited along the beaches on the east and west sides of the inlet.

-- Opiton 3:

The final option would be to construct a 100' long jetty on the western shoreline and resheath the existing eastern jetty.

A deposition basin would be created on the updrift side of the east jetty. Material initially removed from the depositon basin would be used to rebuild the dunes to the east. Thereafter, the material (sand) from the deposition basin would be bypassed to the west side of the Creek. All material placed in the dune area will be planted with American Beach Grass, and access across the dune will be provided by an approved walkway.

Sand dredged from the mouth of Hawks Creek would be placed on the west side of Hawks Creek.

If a coastal storm destroys or significantly damages the protective dune to the east, all deposition basin material and dredging material will be used to rebuild the dune. Vegetation will be planted to control eolian erosion, and walking or crossing the dune will be controlled as above.

If an erosion rate of 1 foot, or more, per year is documented on the eastern shoreline, then deposition basin and dredging material will be placed along the beach to ameliorate the observed erosion.

7. Option Evaluation and Selection

In considering which option is appropriate, one must strive for a balance of economic, environmental and social values, through the application of appropriate regulations. If option one is selected, the beach and dune system to the west of Hawks Creek will continue to erode. Eventually, the dune will be destroyed and the marsh behind it adversely effected and probably destroyed. The channel to Hawks Creek will have to be frequently dredged to allow boating access to Great Peconic Bay. Sand placed on the beach east of the inlet would re-enter the littoral transport system and shoal in the creek mouth. The shoreline to the east would remain unaffected, since it cannot accrete past the most seaward point of the eastern jetty.

The selection of option two would establish a fixed channel between two jetties. The extension of the eastern jetty would cause sand to deposit updrift (east) of the structure. This would eliminate dredging until the 50' length of jetty had filled to impoundment capacity. Thereafter, sand would spill around the east jetty and into the channel in the same manner and magnitude as now. The eastern shoreline would accrete to the seaward end of the jetty and stabilize. The construction of the western 200' jetty would stop sand that now enters the channel from the western side. However, erosion on the west side would continue, since sand is being trapped by the eastern jetty. The protrusion of the jetties into Great Peconic Bay would also increase erosion on the western shoreline, due wave induced swirling eddy currents.

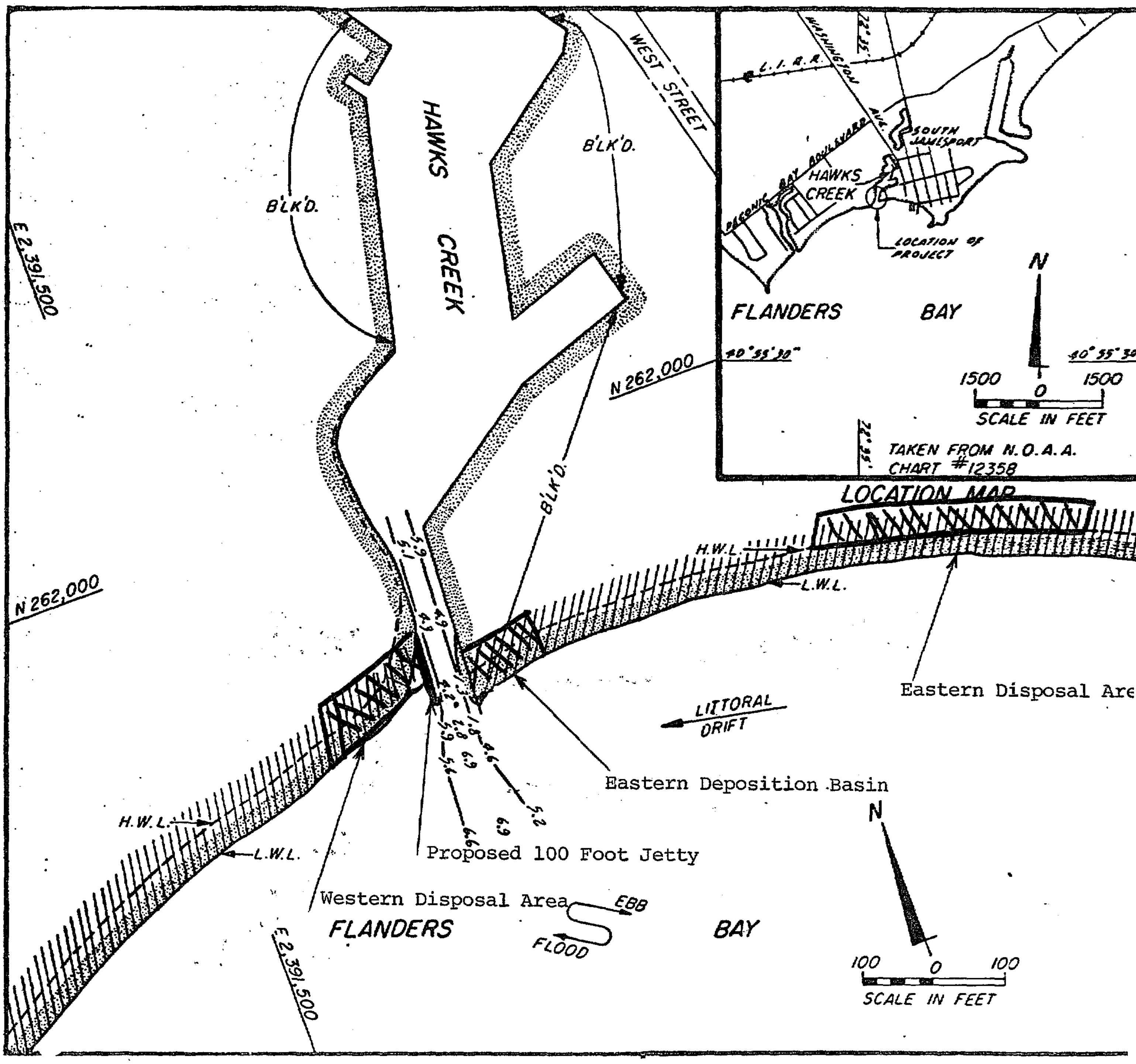


Figure 7: Summary of option three for Hawks Creek, Riverhead, New York

Option three entails reduced jetty construction and changing dredging and disposal areas. The area to the east of the eastern jetty would be regraded to form a deposition basin. Initially, the material would be removed from the basin and used, placed, to reinforce weakened dunes to the east. This action will provide increased protection for the structures east of the Creek. Since this material will be placed above the zone of normal wave uprush, it will not immediately re-enter the littoral transport system and cause increased inlet shoaling. After the initial regrading, deposited material from the basin would be bypassed to the west side of the inlet. This action will have no effect on the eastern shoreline, since the sand has already passed by the beach and would otherwise shoal in the inlet throat. The establishment and maintenance of the deposition basin will reduce shoaling in the inlet, and thus decrease dredging frequency. The reinforced dune should provide appropriate flood protection to upland properties. Construction of a 100 foot jetty on the western side of the inlet will also prevent sand from entering the channel on this side. However, the shorter jetty will lessen the adverse erosion impacts caused by wave refraction creating swirling eddies. The changing of dredge disposal to the west side of Hawks Creek should stabilize, but not cause the shoreline to accrete, since natural wave action will continue to move the sand further west. The provisions for both catastrophic and chronic erosion conditions are unique to this option and reflect the need to monitor changes to the adjacent shorelines and the location of inlet shoaling. This flexibility is necessary to maintain the balance of economic, environmental and social values.

Based upon the above evaluation of the recommended options, option 3 offers the best opportunity for:

1. Effective erosion control for the shorelines adjacent to Hawks Creek.
2. Reduced inlet shoaling and subsequently inlet dredging.
3. Minimal adverse environmental impact.

Thus, it offers the best balance of economic, environmental and social values unique to the South Jamesport area.

8. Future Actions

Coastal projects affecting tidal inlets are challenging because conditions are always changing. Effective management must recognize, understand and work with the changes. Otherwise, the uniqueness of the inlets is lost to uniformity.

In reaching a management decision on Hawks Creek, all available information should be reviewed. This existing documentation should be made available to the proper reviewing agencies. The avilability of this information should decrease the amount of time needed for review, and improve the management decision. The following types of information are important to the review of projects affecting tidal inlets:

1. Historical maps and charts, including property surveys.
2. Historical aerial photographs.

3. Dredging and construction records.
4. Scientific and technical reports, including field surveys and periodic observations.

After a project has been completed, it is important to observe the actual effects upon the shoreline. The effective coastal manager must determine these effects through on-site investigations and discussions with field work, the people whose daily lives are effected by the decision. Their observations should be recorded so that the effects can be quantified and management decisions modified to reflect actual conditions. For Hawks Creek, a series of periodic observations should be established.

9. References Cited

Disney, L.P., 1955, Tide Heights Along the Coasts of the United States, Proceedings ASCE., 81, Separate No. 666. 9.p.

Donn, W.L. and D.M. Shaw, 1963, Sea Level and Climate of the Past Century, Science 142 - 1166-1167.

Davies, D., Axelrod, and O'Conner, 1972, Erosion of the North Shore of Long Island, Tech Report #18, M.S.R.C., SUNY at Stony Brook, NY, 11794.

Eisel, M.T., 1977, A Shoreline Survey: Great Peconic, Little Peconic, Gardiners and Napeague Bays, SUNY @ Stony Brook, Marine Science Research Center, Special Report 5, 77-1.

Hicks, S.D., 1972, On the Classification of Trends of Long Island Period Sea Level Series, Shore and Beach, 40 (1): 20-23.

Rainey, W., 1985, Personal Communication.

Suffolk County, Department of Public Works, 1984, Dredging Summary, County Center, Yapank Avenue, Yapank, New York, 11980.

Terchunian, A.T. and C.H. Fletcher III, 1984, Current and Shoreline Effects of Shore Perindicular Structures, in Proceedings of the 9th Annual Coastal Society Conference.